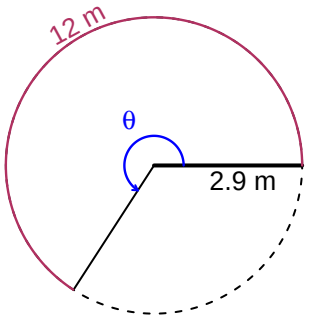
Name: Date:

Trig Final (SLTN v614)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.9 meters. The arc length is 12 meters. What is the angle measure in radians?

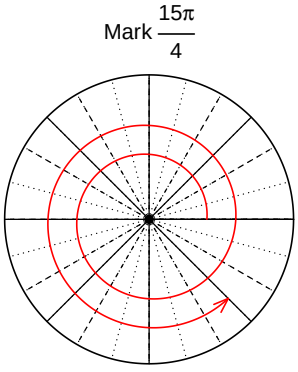


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

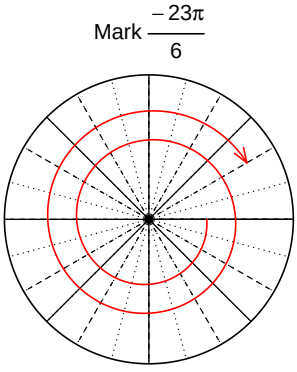
$\theta = 4.138$ radians.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(15\pi/4)$



Find $\sin(-23\pi/6)$

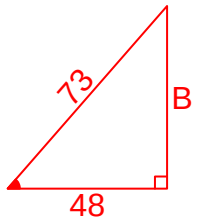
$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-23\pi/6) = \frac{1}{2}$

Question 3

If $\cos(\theta) = \frac{-48}{73}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

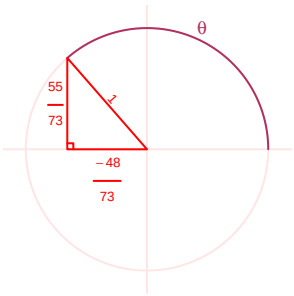
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + B^2 = 73^2$$
$$B = \sqrt{73^2 - 48^2}$$
$$B = 55$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{55}{73}}{\frac{-48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.13 Hz, a midline at $y = 7.01$ meters, and an amplitude of 5.59 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.59\cos(2\pi 4.13t) + 7.01$$

or

$$y = 5.59\cos(8.26\pi t) + 7.01$$

or

$$y = 5.59\cos(25.95t) + 7.01$$